

HR-151 Surface Improvement and Dust Palliation of Unpaved Secondary Roads and Streets

Key Words: Dust Control, secondary roads, road maintenance

INTRODUCTION

As of December 31, 1970 there were 57,270 miles of Local Secondary roads and 32,958 miles of Farm to Market roads in the Iowa secondary road system. The Local Secondary system carried a traffic load of 2,714,180 daily vehicle miles, accounting for 32% of all traffic in the secondary system. For all Local Secondary roads having some form of surfacing, 98% were surfaced with gravel or crushed stone. During the 1970 construction year 335 miles of surfaced roads were constructed in the Local Secondary system with 78% being surfaced with gravel or crushed stone.

The total maintenance expenditure for all secondary roads in Iowa during 1970 amounted to \$40,086,091. Of this, 42%, or \$17,020,332, was spent for aggregate replacement on existing gravel or crushed stone roads with an additional 31% (\$12,604,456) being spent on maintenance other than resurfacing. This amounts to 73% of the total maintenance budget and are the largest two maintenance expenditure items out of a list of 10 ranging from bridges to drainage assessments. The next largest item was 7%, for maintenance of existing flexible bases.

Present costs of high type flexible or rigid pavements range from \$40,000 per mile and up. Because of high cost, budget limitations, and low mileage of high traffic volume on Local Secondary roads, most Iowa counties are severely restricted as to the number of miles of roads that may be paved each year. Present design and construction standards provide adequate means for improvement of grade and cross section of secondary roads followed by: (a) immediate road metal surfacing, or (b) eventual high-type surfacing. There are, at present, no formal provisions for an intermediate type surfacing between these two extremes. Therefore, nearly all Iowa counties are in a situation in which they have only a few miles of high-type pavements with the bulk being surfaced with gravel or crushed stone.

Dust creates a safety hazard to both passing and oncoming traffic. It is also a definite household nuisance in rural areas, especially in heavily populated regions surrounding larger towns and cities where traffic on unpaved roads may range as high as 500 vehicles per day. The severity of these problems continues to increase as:

1. traffic volume increases,
2. more people move to rural areas surrounding larger towns and cities, and
3. as the current concern over air pollution increases. The Iowa Air Pollution Control Commission has drafted guidelines with respect to "fugitive" dust, which ultimately will affect all unpaved state, county and city roads and streets.

Besides the above problems, most counties are faced with rising costs of high type pavement, rising costs of maintenance, and rising costs of replacement aggregates.

The foregoing considerations dictated the need for finding a means to provide for low-cost surface improvement and dust control, using existing in-place materials, for immediate (and intermediate) use as a treated surface course on unpaved secondary roads - the objective of this research project. Three concurrent phases of study were included in the project:

1. laboratory screenings studies of various additives thought to have potential for long-lasting dust palliation, soil additive strength, durability, and additive retention potential;
2. test road construction using those additives that indicated promise for performance serviceability usage; and
3. observations and tests of constructed sections for evaluation of the additive's contribution to performance and serviceability as well as the relationship to initial costs.

Criteria for additives considered as potential dust palliatives and surface improvement agents in this project were:

1. Economic - \$5,000-or less per mile, with \$10,000 as absolute maximum for consideration.
2. Water solubility or water dispersability - for ease of mixing with soil - but becoming water insoluble after incorporation, providing chemical bonding, waterproofing, or other immunities to deterioration by roadway environment and traffic abrasion for an indefinite period of time.
3. No requirement for specialized handling, or construction equipment, other than normally available within a county road unit or through a contractor.
4. Improvement of strength and density of a roadway surface, though advantageous, was not essential so long as adequate dust control and stability versus time was maintained.
5. Must range from a surface penetrant type to easily mixed in-situ up to six inches in depth, utilizing existing roadway soil/aggregate materials without importation of additional soil or aggregate.
6. Within the range of criteria 1 through 5, quantity of additive must not exceed 4-5% by dry soil weight.